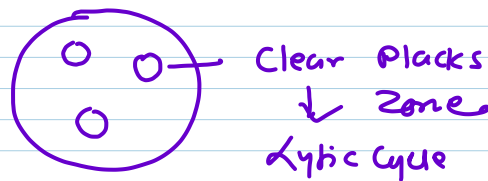
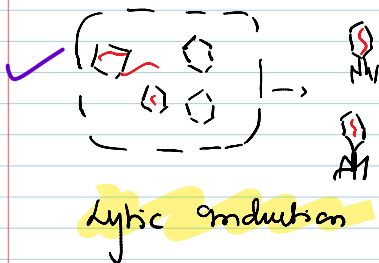
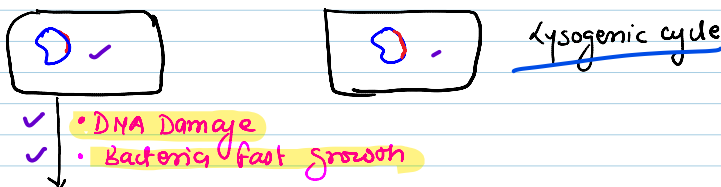
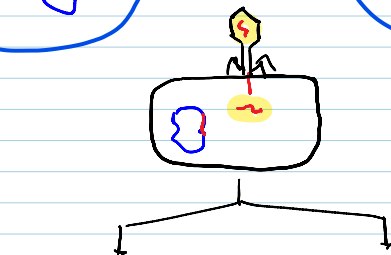
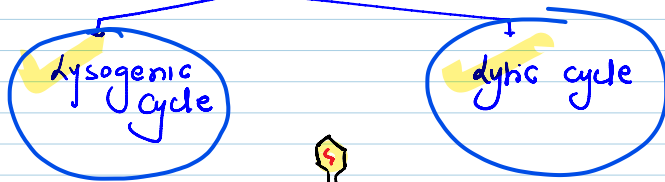


Viral gene Regulation

✓ 1 - Phage Gene Regulation

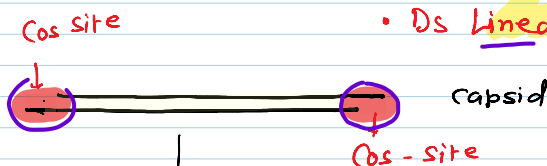
Temperate phage ✓



1 Phage → genome size = 48.5 KB ✓

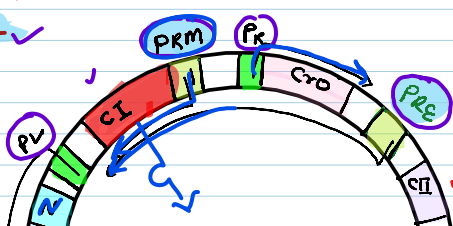
• Ds Circular DNA in Bacteria ✓

• Ds Linear DNA in Phage Capsule ✓



lysogenic gene

- CI - Clear 1 ✓
- CII - Clear 2
- CIII - Clear 3

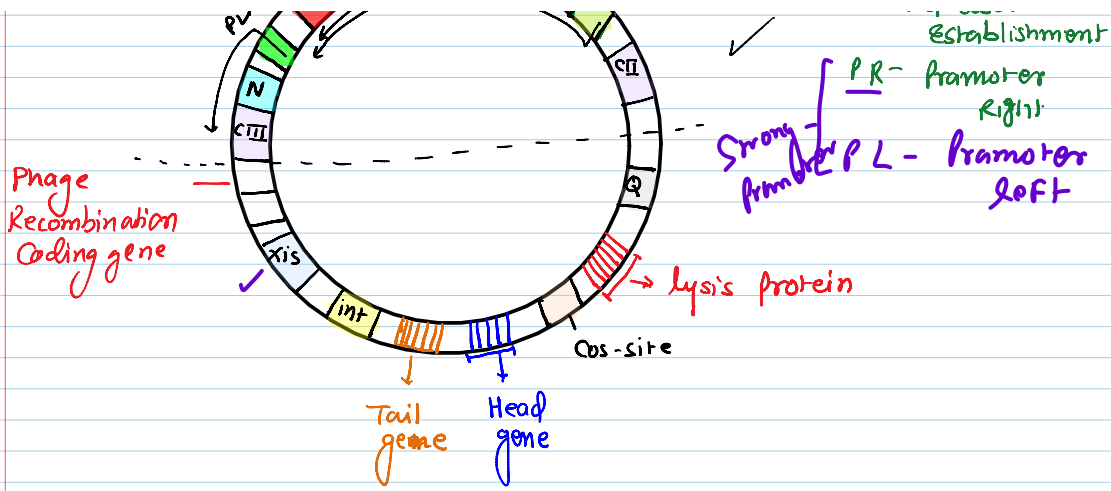


Weak Promoter

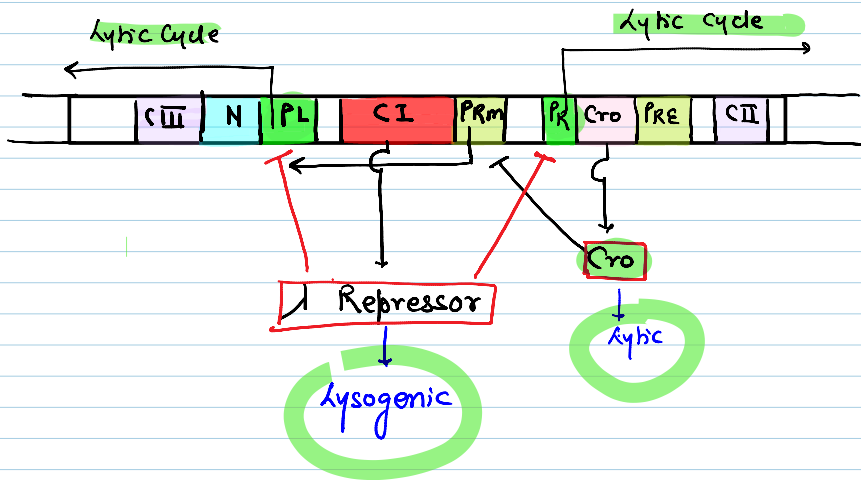
- PRM → Promoter Repressor maintenance
- PRE → Promoter Repressor Establishment

Strong Promoter

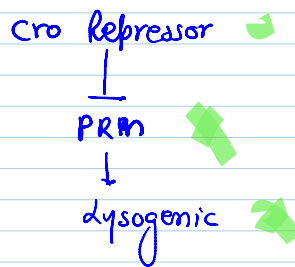
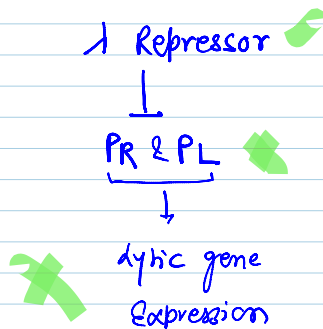
- PR → Promoter
- PL → promoter left



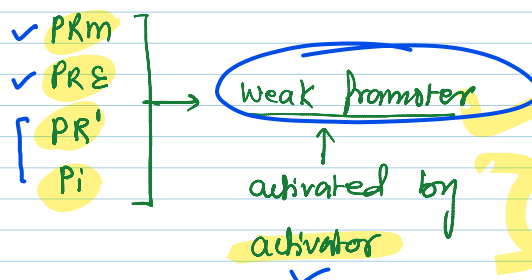
- ✓ CI gene → 1 Repressor ✓
- ✓ Cro gene → cro Repressor



PL } - strong
PR } promoter
↓
lytic cycle

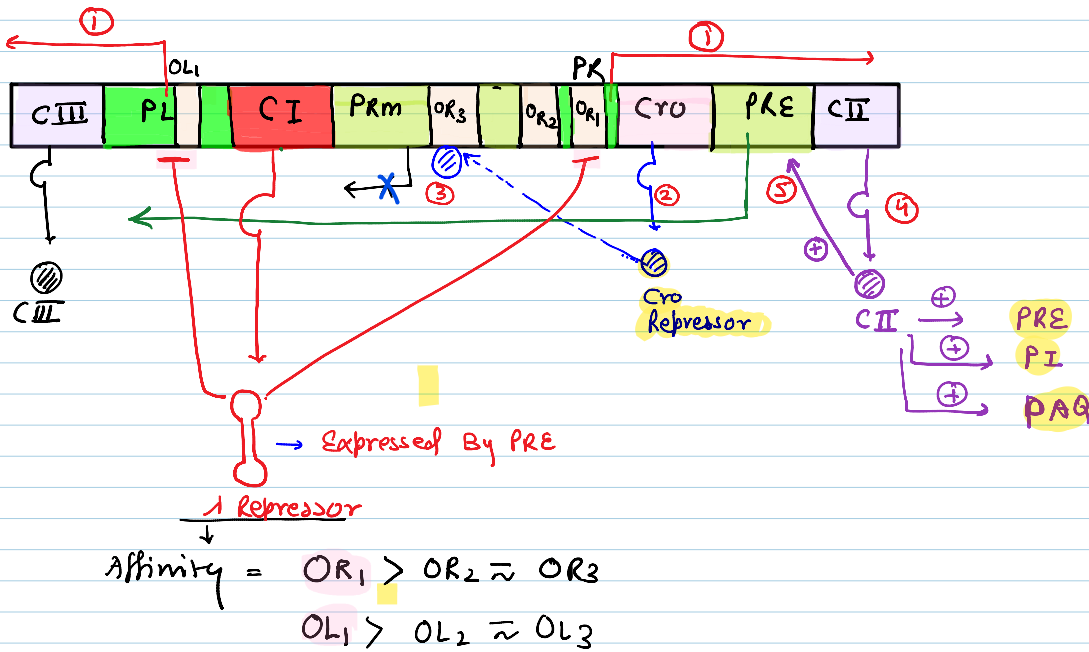


✓ PR } - Strong promoter
✓ PL }



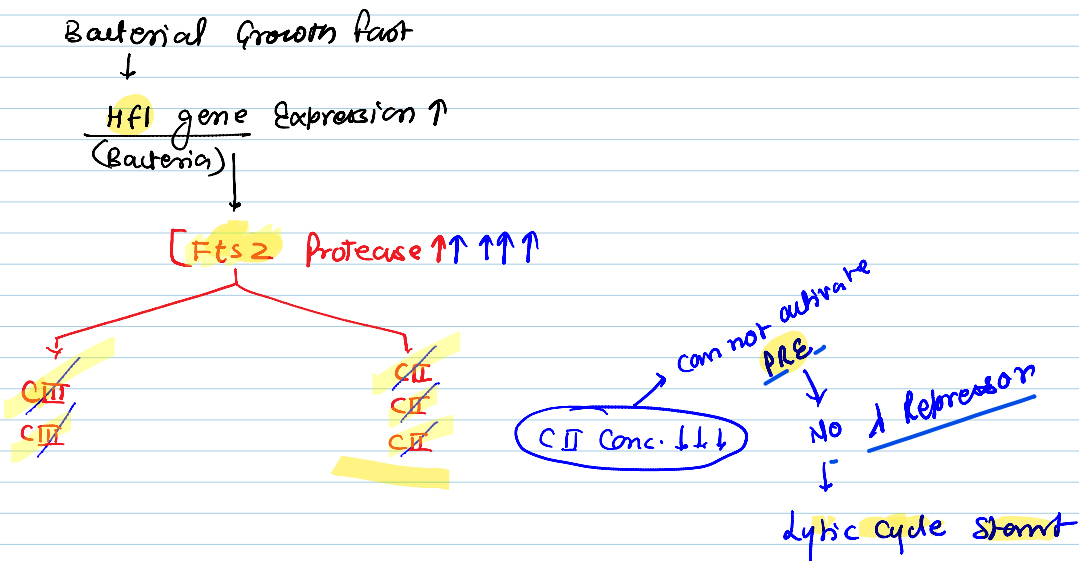
Lytic and lysogenic cycle depends upon
Bacterial Growth Condition

Condition 1 → Bacteria slow growth condition -



* CIII is molecular mimic of CII

in fast growth condition CII is degraded

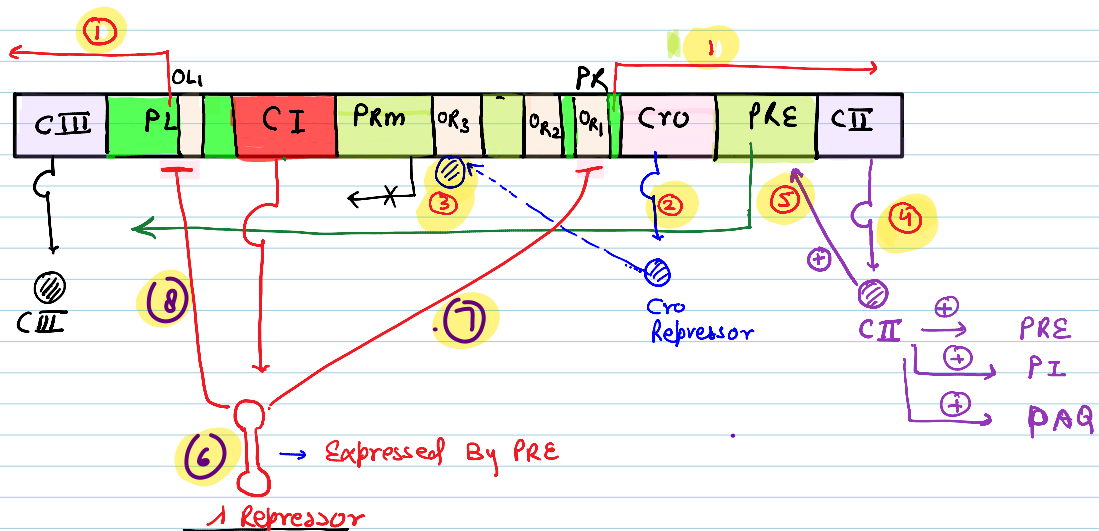
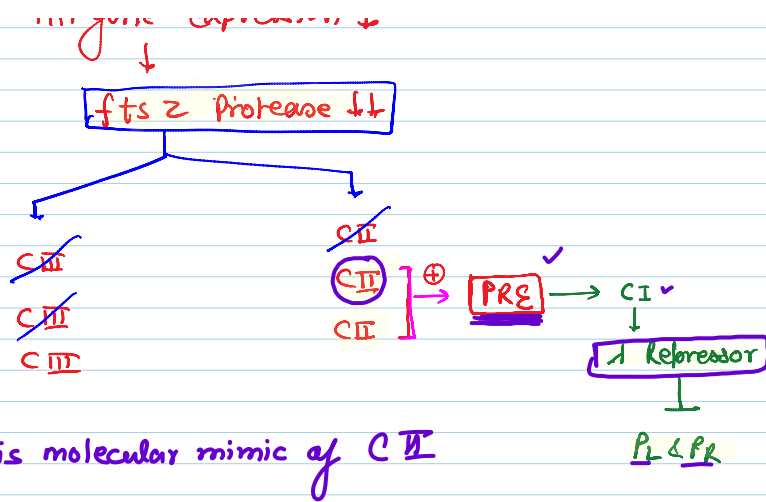


When Bacteria not in slow growth condition

Hfl gene Expression ↓

↓

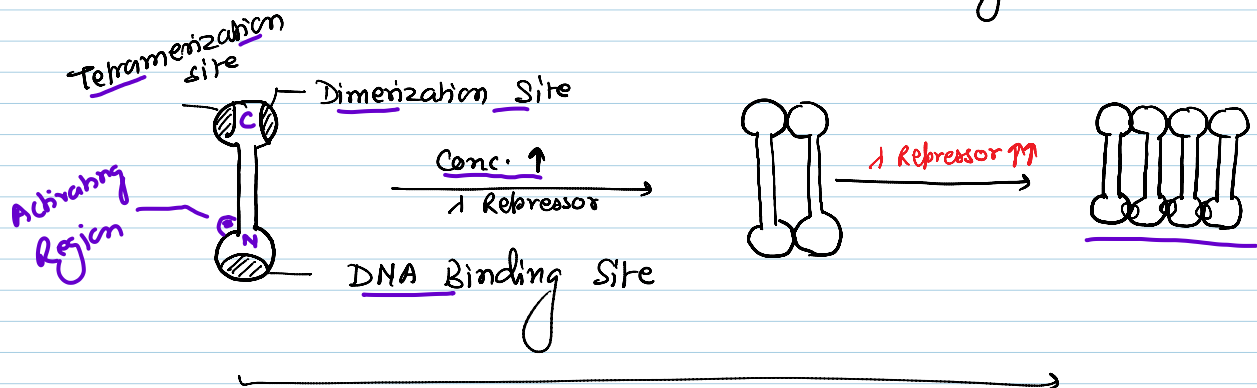
[FtsZ Protease ↓↓]



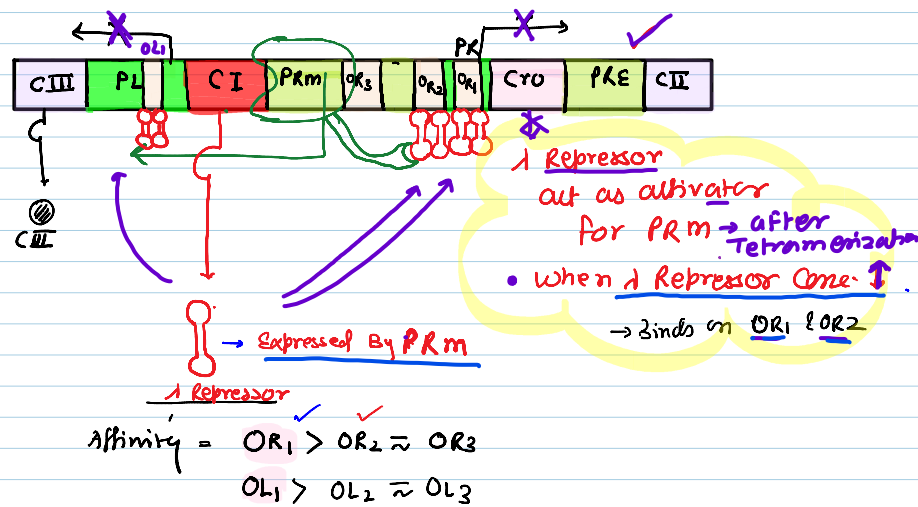
$$\text{Affinity} = OR_1 > OR_2 \approx OR_3$$

$$OL_1 > OL_2 \approx OL_3$$

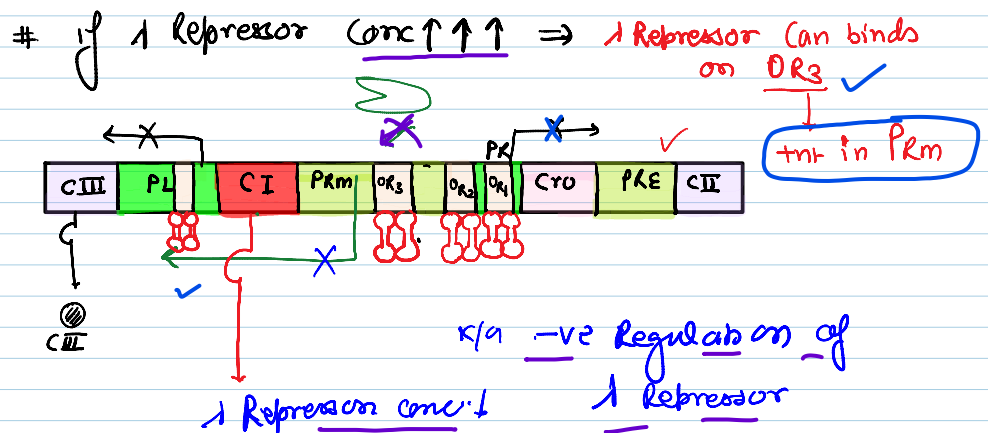
1 Repressor Shows Co-operative Binding



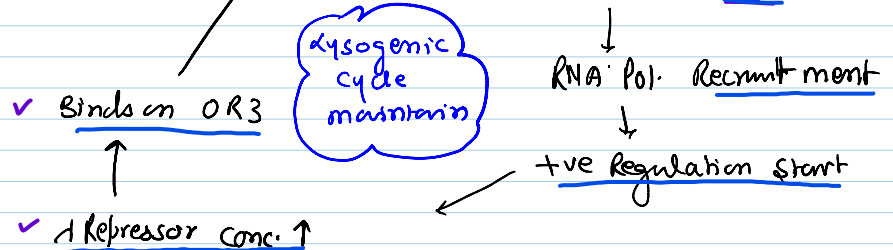
1- Repressor maintain dysogeny By PR_m



• 1 Repressor Conc. maintained in cell



- if 1 Repressor Conc. ↓↓ ⇒ 1 Repressor dissociates from OR₃



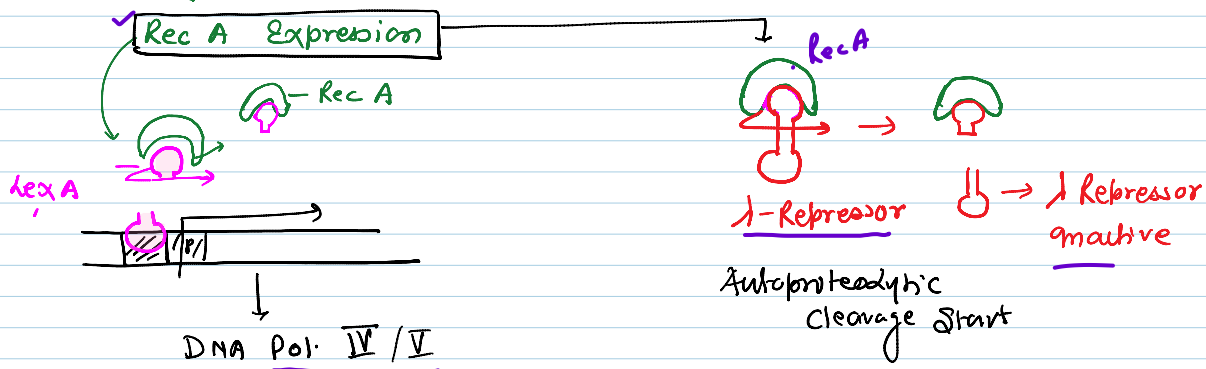
Lytic Induction

• Bacterial cell Exposed in U.V. light ✓

↓
Excessive DNA Damage ✓

↓
lytic induction ✓

DNA Damage



DNA Damage ↑

↓
RecA ↑ = Repressor ↓

↓ dissociates from

OR₃, OR₂, OR₁

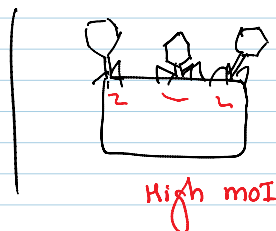
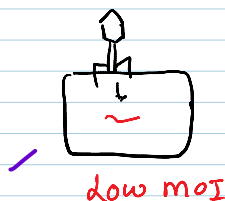
OL₃, OL₂, OL₁

✓ lytic Cycle



Fast growth Condition of Bacteria

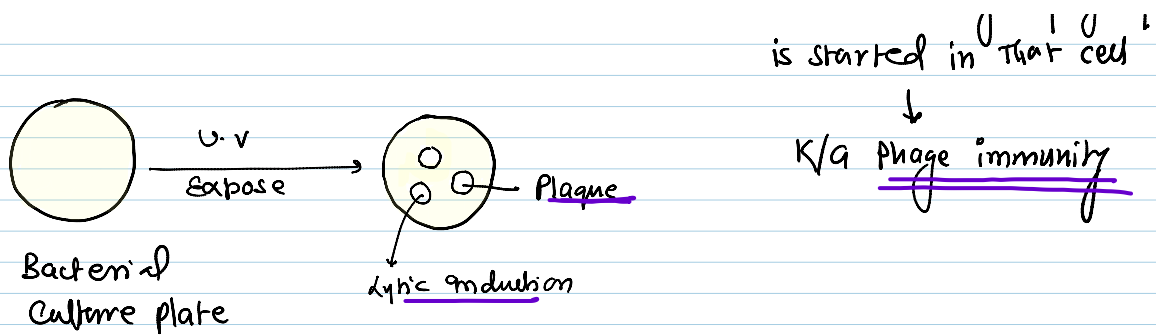
low multiplicity of infectivity [Low MOI]



if 1 phage already infected
in a cell then other

phage cannot infect.

The same cell is dysogenic



Lysogeny & lytic cycle Depends upon -

- Growth Condition of Bacteria
- MOI

① Slow Growth Condition → lysogenic cycle
MOI ↑ = CII conc. ↑

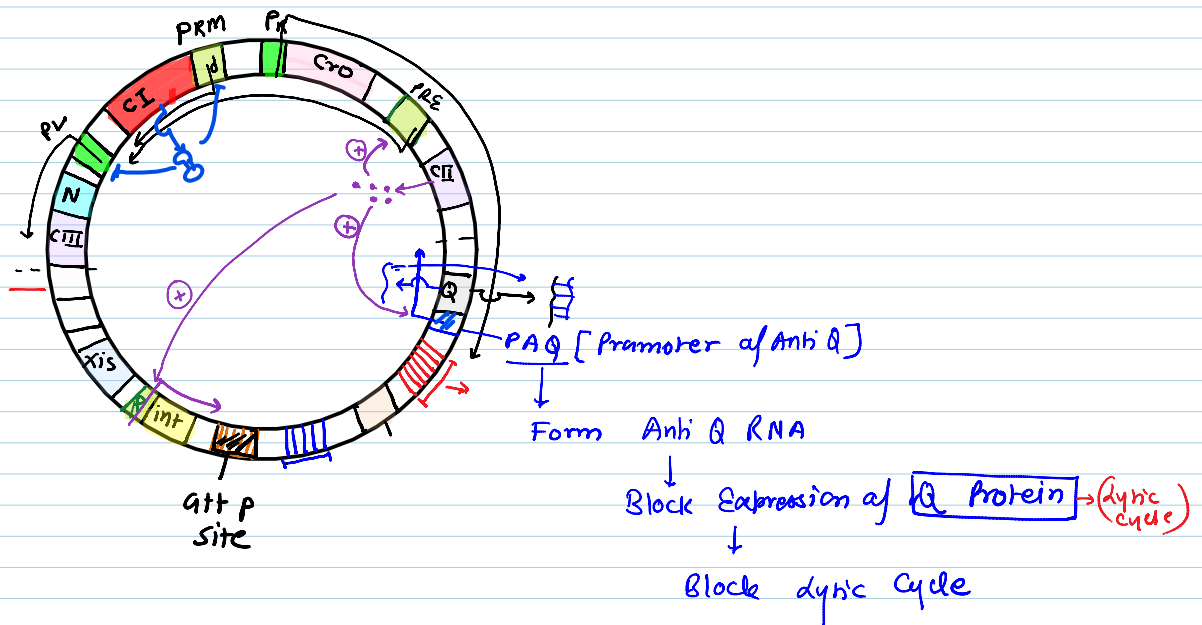
② Fast Growth Condition → lysogenic cycle
MOI ↑ → CII ↑↑

③ Fast Growth Condition Fts ↑ → lytic cycle
MOI ↓ → CII ↓↓

④ Slow Growth Condition → lysogenic cycle
MOI ↓
Fts ↓
CII (CIII) ↑
PRE CII

lysogenic cycle →

CII level ↑ ⊕ → PRE → 1 Repressor ✓
 ⊕ → PI → Integrase ✓
 ⊕ → PAQ → Antisense RNA for ϕ RNA

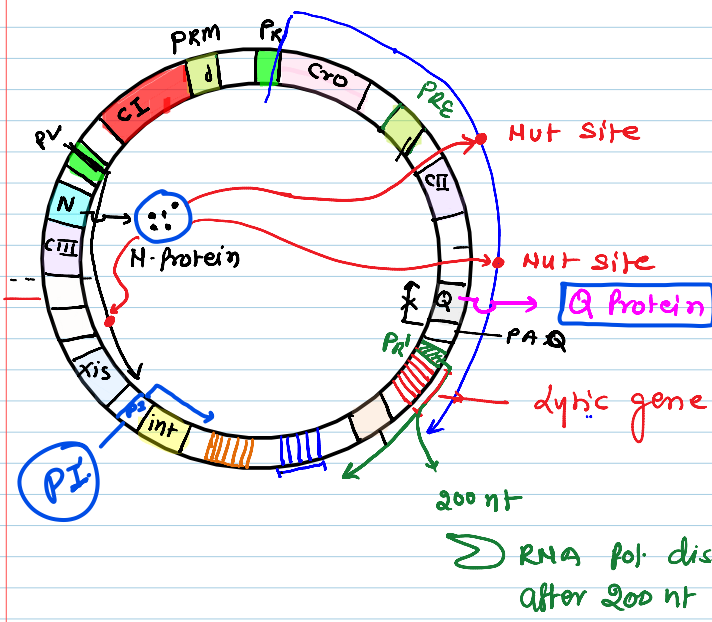


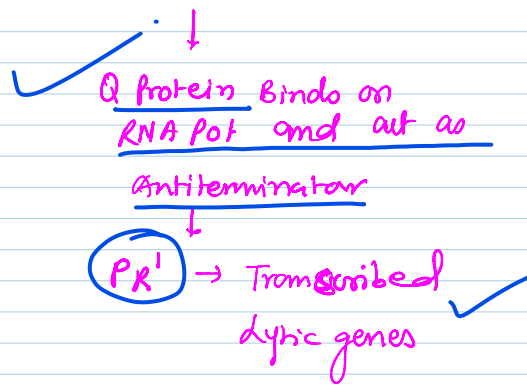
dyshic Cycle

CII level ↓ → PRE Expression ↓ ×
→ CI gene off

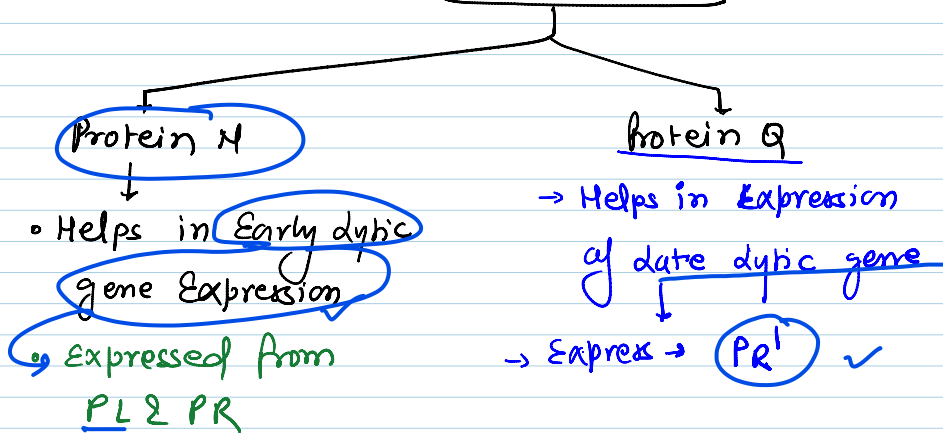
✓ PR & PL Express

PR' Expressed ✓





Full length Transcript from PL & PR is due to Antiterminator



Protein N - Binds on [N utilization site]

Transcript That is
 Expressed from PR & PL
 ↓
 Prevent premature termination

Reoregulation of integrase →

In lysogenic cycle → No Retrograde regulation

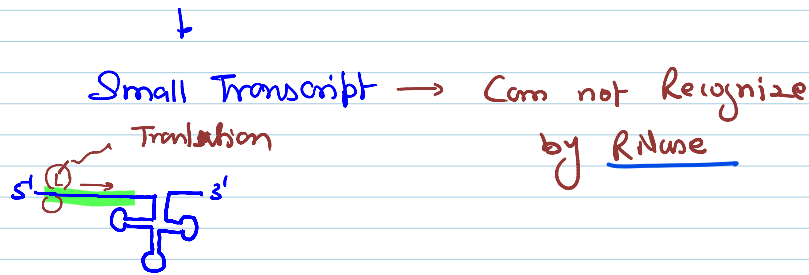
Integrase Express from PI

↓
 Weak promoter

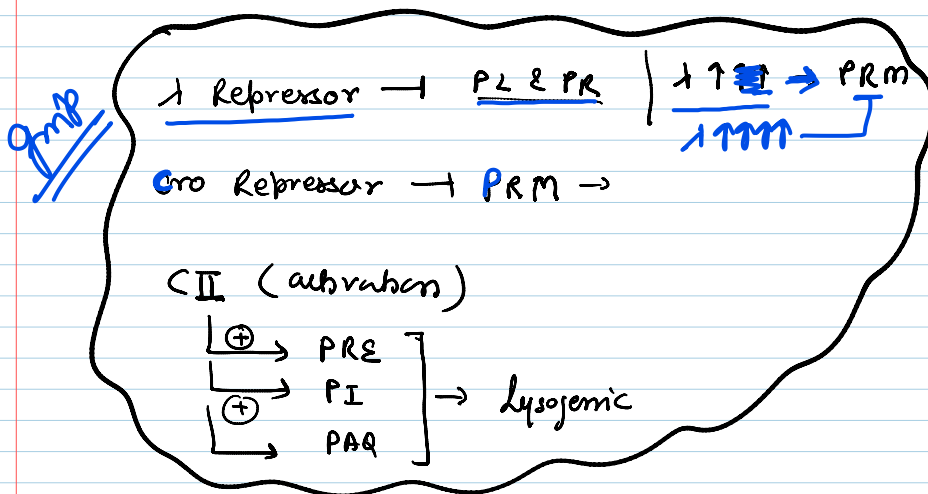
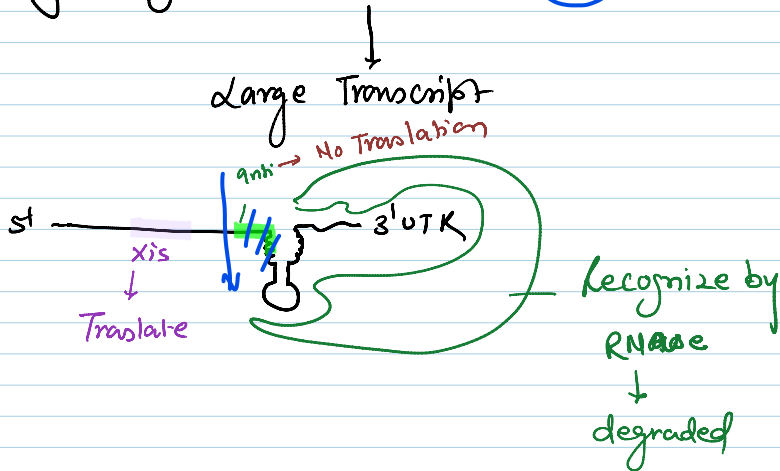
↑ ⊕

CII - act as activator

if integrase Express PI promoter

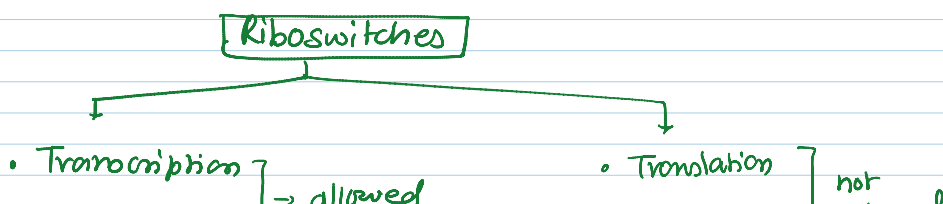


if integrase express from P_L [in lytic cycle]



Riboswitches ✓

- Regulation after Transcription
- tnt towards 5' UTR of mRNA
- Form 2° Str.

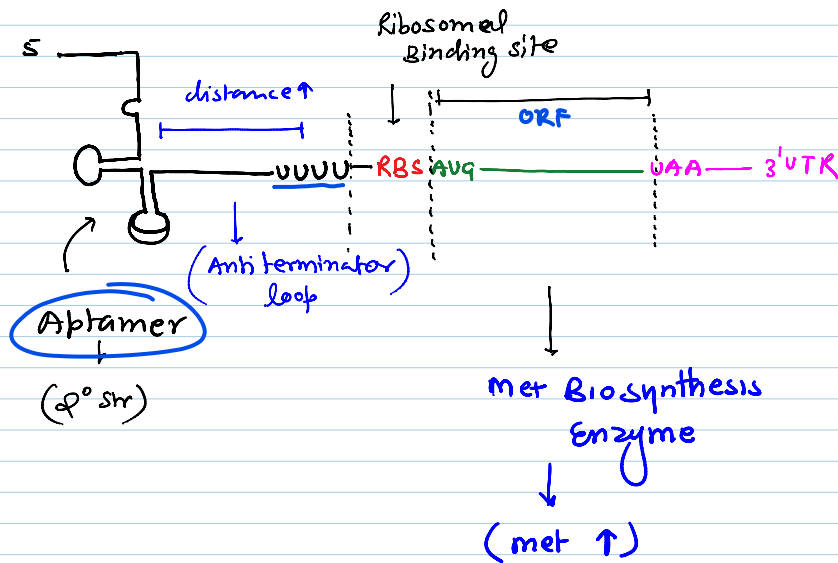


- Transcription
 - Translation
- allowed

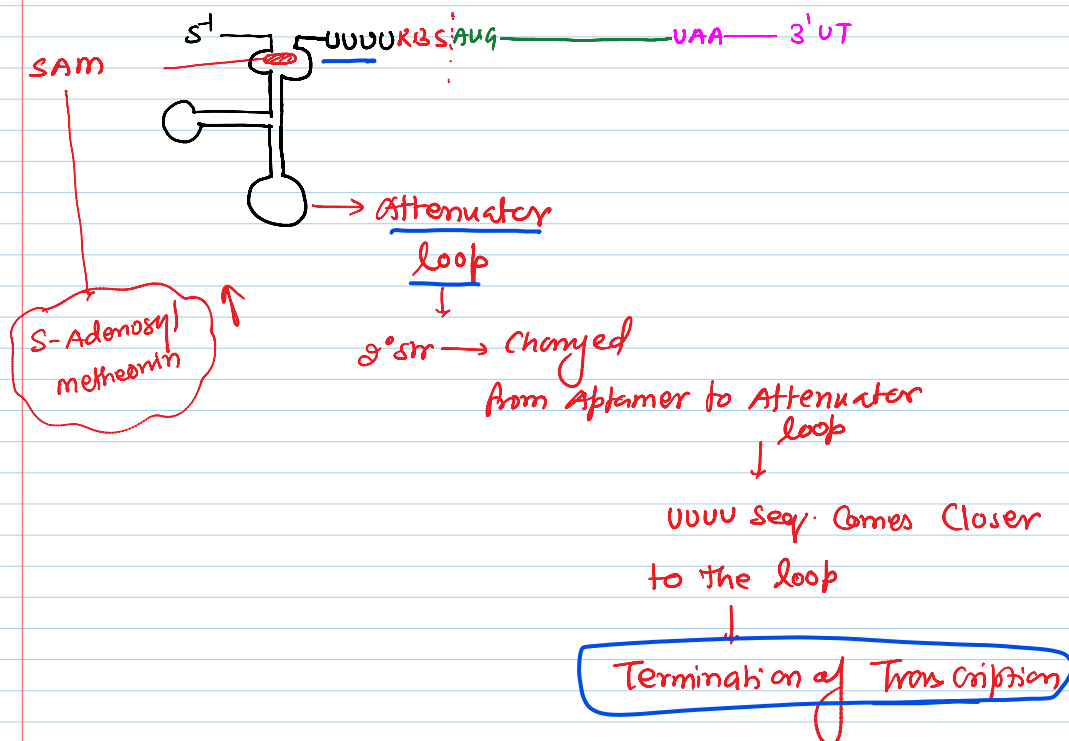
- Translation
 - Transcription
- not allowed

eg → met Biosynthesis ✓

↓
gene express when met ↓↓



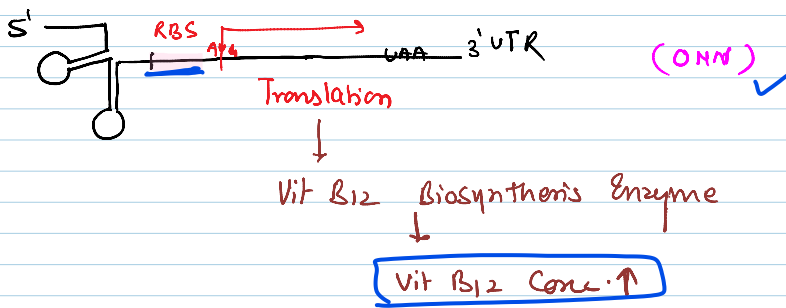
② if met ↑↑



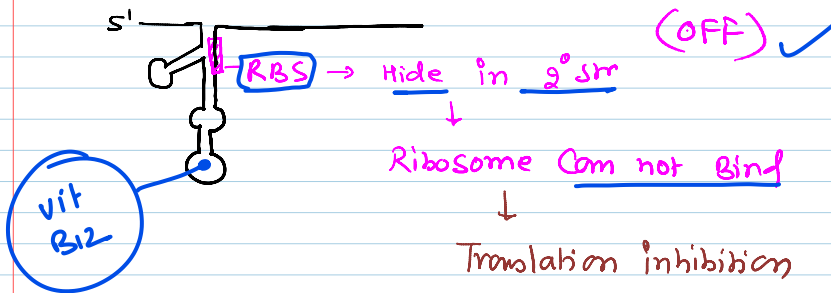
Vit B₁₂ Operon

Translation level

① when Vit B₁₂ Conc. ↓



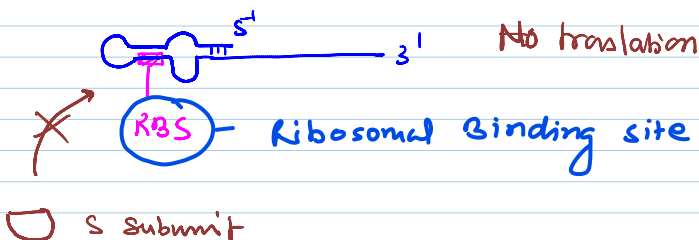
② if Vit B₁₂ ↑↑



- eg - ✓ Niacine
- ✓ Vit B₁₂
- ✓ Met
- ✓ Adenine
- ✓ Guanine
- ✓ flavin
- ✓ Triamine

→ eg. of Riboswitches
That for 2° str. for
Regulation

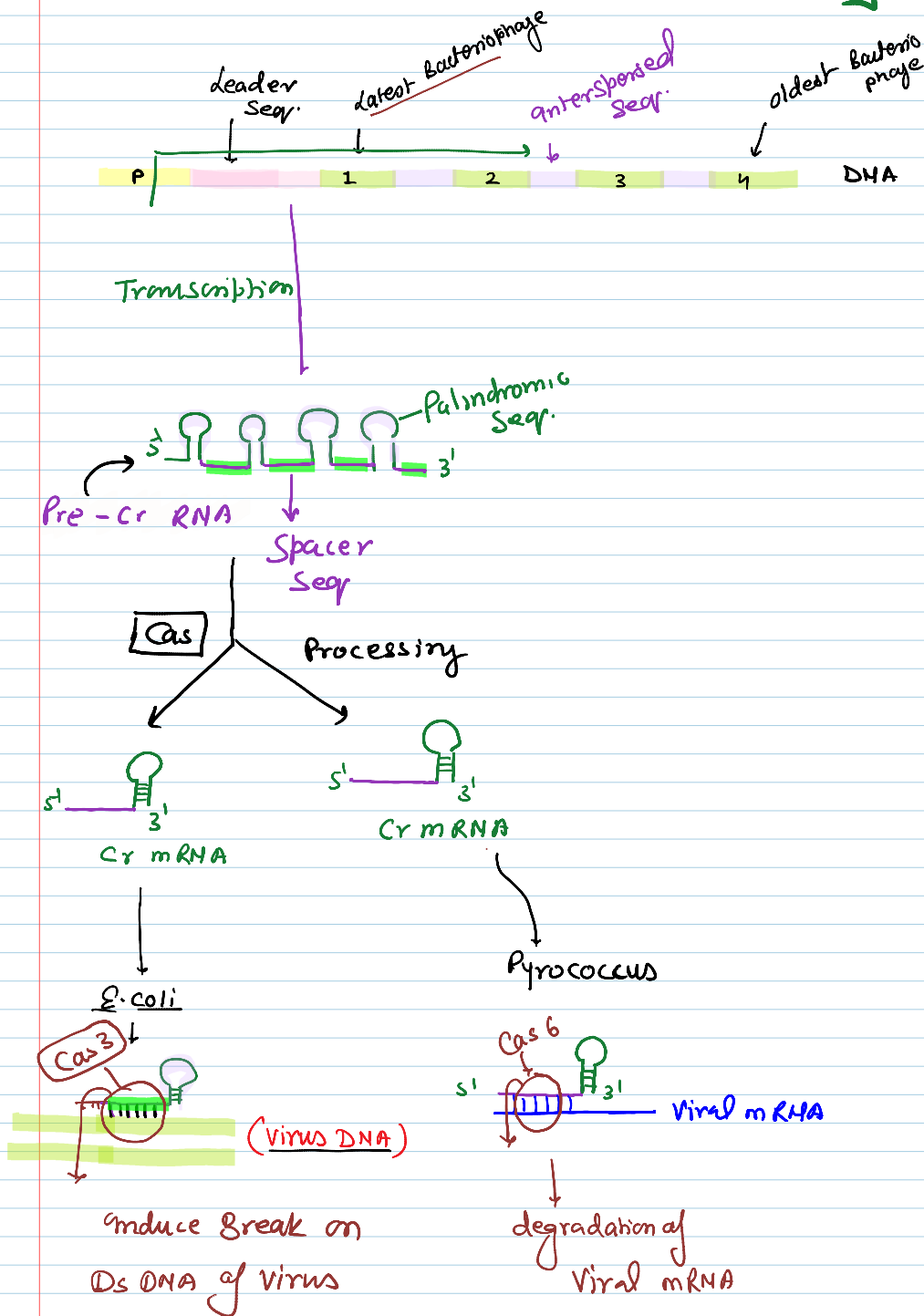
⇒ Regulation by Short RNA [sRNA]



RNA mediated Defence against Bacteriophage

eg. CRISPR Clustered Regulation

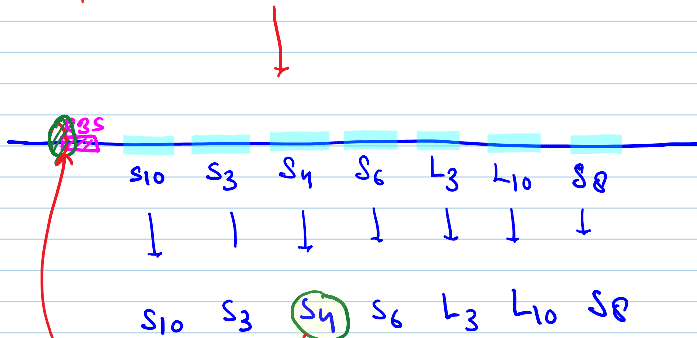
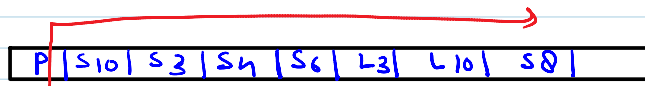
eg - CRISPR [Clustered Regulatory Interspersed Short Palindromic Repeats]



Regulation of Gene Expression at Translational Initiation Level -

eg - Ribosomal Protein Synthesis

= S₁₀ Operon



if rRNA
conc ↓

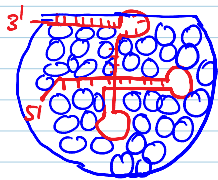
S₄ binds on RBS

Translation

has affinity with 16S rRNA

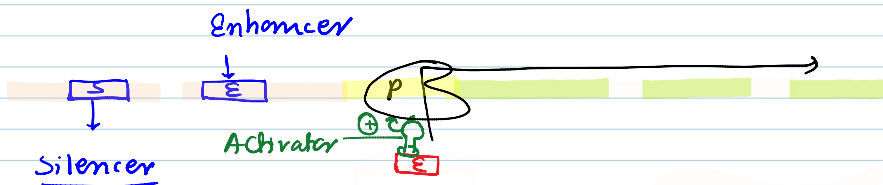
if sufficient rRNA + nt → operon ON

if rRNA conc ↓ → operon off

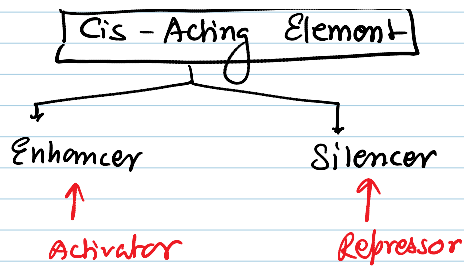


Regulation In Eukaryote -

① Transcription level → Initiation level



Cis - Acting Element

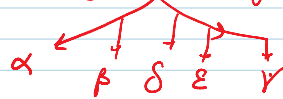


Cis - Acting Elements \rightarrow \pm in Range of ≈ 30 KB
 near The gene
 which has to be regulated

Trans-acting Enhancer Seq. (DNA)

eg - ① locus Control Region [LCR]

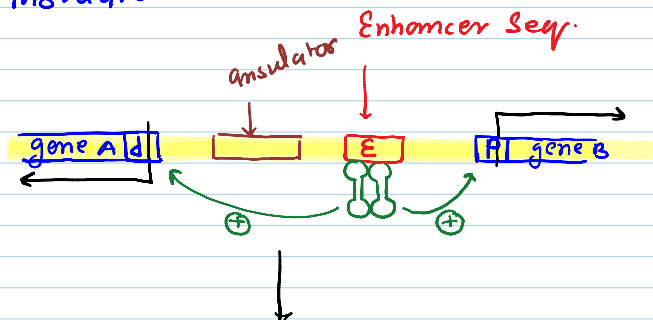
involve in Expression of Globin gene



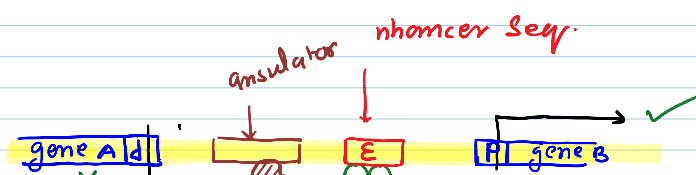
② Global Control Region

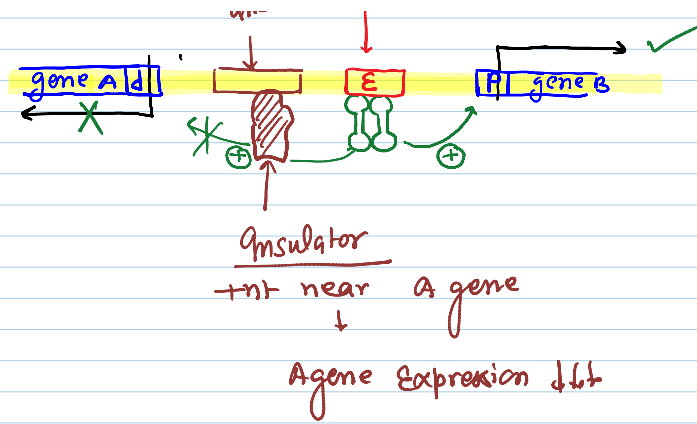
Cis-Acting Element

- Enhancer
- Silencer [operator]
- Insulator



To Express only 1 gene





Gene Regulation

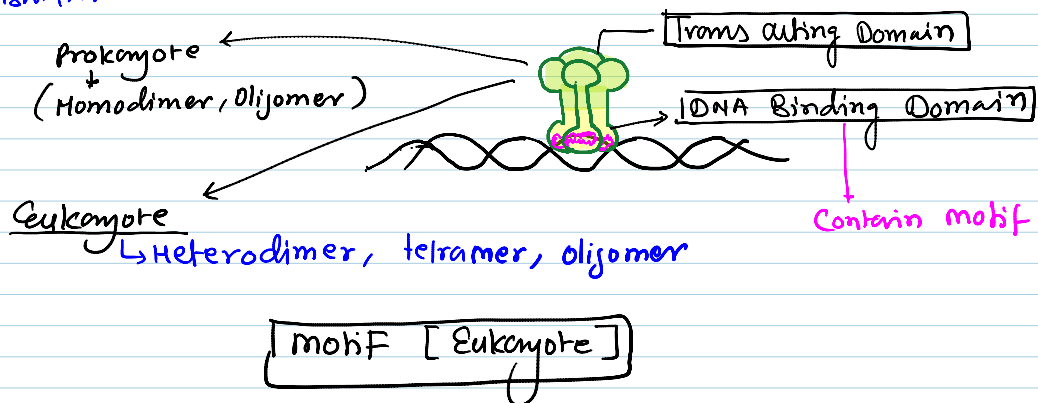
Cis / Trans acting Elements

↓
DNA Seq.

- Enhancer
- Silencer/operator
- insulator

Trans-acting Factor (Protein)

- Activator
 - Repressor
 - insulator
- Contain 2 Domain



① Helix-turn Helix